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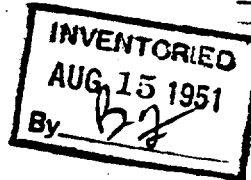
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Clinton Engineering Works

Carbide and Carbon Chemicals Corporation

Laboratory Division
Works Laboratory Department

Report of Trip to the Medical Section
Rochester, New York

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Say W. Hall for *A.S. Quist* 7/21/95
Technical Information Officer Date
Oak Ridge K-25 Site

N. H. Ketcham

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Report of Trip to the Medical Section
Rochester, New York
(Including a Visit to the Taylor Instrument Companies, Rochester, New York)

- Part I: Status of Tests on Mask, gas, service, combat M5-11-7(AZ)
Part II: Discussion of Medical Aspects with Dr. F. A. Bryan.
Part III: Visit to Taylor Instrument Companies to Observe the Method
of Protecting Personnel from Mercury Vapor.

Attachments: Rochester Reports of Gas Mask and Respirator Tests.
United States Department of the Interior, Bureau of Mines
Publications Pertinent to Testing of Gas Masks and
Respirators.
Title Page and Table of Contents of Comprehensive Summary.
Titles of Rochester Reports to be requested for K-25 Files.

Dates Of Visit to Medical Section: 1-20-47 - 1-24-47
Date of Visit to Taylor Instrument Companies: 1-23-47

C&CCC Representative: N. H. Ketcham, Industrial Hygiene Section,
Works Laboratory

Approved by: _____

Supervisor, Works Laboratory

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Part I: Status of Tests on Mask, gas, service, combat, M5-11-7 (AZ)
Cannister M-11 assembly, Stock # C5-3-588 (Referred to as B-2
Cannister containing Whittlerite - Dark Green Code Color)
Mask Stock # 511509

At the present time we do not have adequate data to substantiate our use of this mask to protect our personnel. Experience indicates this mask may be suitable for our needs, but only one brief investigation with hydrolyzed C-616 (UO_2F_2 & HF) has been reported. This one report (Rochester report M1648, not in K-25 files) is indicative, but not conclusive. No other written reports on tests of this mask cannister for protection against other uranium salts, F_2 , C-816, C-716 or other contaminants encountered in the K-25 area were found.

Considerable mask testing has been done in Rochester, but except for Report M1648 the B-2 Whittlerite cannister was not included in the tests. A list of Rochester reports pertaining to mask testing is attached. Those now in the K-25 files are identified by (K-25). The others will be requested.

The writer conversed, by telephone, with Captain George Lyon, Room 1072A, Main Navy Building, Washington, D. C.. Captain Lyon was recommended as having had considerable experience with the mask and cannister we use while in charge of the S-50 operations in the Philadelphia Navy Yard. This experience had not been reported. However, Captain Lyon agreed to send Major Brundage a report of his findings, including observations of sensory levels of detection of the hydrolysis products of C-616. The Rochester office also suggested that Captain Bernard S. Wolf, U. S. Atomic Energy Commission, P.O.Box 42, Station F, New York 16, N. Y., be requested for a report of his experience with the mask. This should be requested through Major Brundage.

A mask testing program to obtain mask data pertinent to the needs of the K-25 area appears to be necessary and feasible. This program should include particle size studies, as the Rochester Section is obtaining data which indicates that the particle size of uranium salts influences toxic properties very markedly. For example, relatively non hazardous TO_2 can become a serious hazard if the inhaled particles are in the order of 0.1 micron. By sampling efflux cannister atmosphere with a cascade impactor constructed after the design used by Rochester, the particle size distribution and total contaminant data would give results comparable to the animal study data being obtained at Rochester. The basic techniques of mask testing used at Rochester are patterned after the U.S. Bureau of Mines Methods. A list of Department of Interior, Bureau of Mines publications pertinent to the work is attached. The writer believes a two day visit to the Bureau of Mines, Pittsburgh, Pa., prior to setting up a mask testing program in the K-25 area, would be desirable.

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PART II: Discussion of Medical Aspects with Dr. F.A. Bryan

(A) Sources of Information

(1.) Summary Medical Research Program 1943-1946. This is a highly condensed compilation of project wide scope. It has not been distributed for that reason. Possibly an extract of information of value to the K-25 area should be requested of Major Brundage for use by our Medical Department.

(2.) Comprehensive Summary of the Pharmacology and Toxicology of Uranium Compounds with Sections on the Pharmacology and Toxicology of Certain Fluorides. This is a very large monograph type publication of declassified information. It is nearly completed and should be distributed within a few months. Dr. Costello will receive a copy. A copy of the Title Page and Table of Contents is attached. A Part III devoted to Special Materials is not yet declassified.

(B) Project Wide Clinical Experience is correlated and disseminated from Rochester and Major Brundage's office. Dr. Bryan did not feel a trip to Rochester by a member of the K-25 Medical Staff would contribute significantly to our knowledge. Clinical data is very limited and as yet inconclusive.

Flood type exposure to C-616 (Philadelphia Navy Yard) is known to result in death. See Special Report available through Major Brundage.

Chronic exposure to C-616 - Report on ten soldiers at Fecleve. (Special Report in K-25 Files)

Beta radiation from U_x - Harshaw has had experience, but no appreciable clinical study made.

Compensation studies of K-25 allegations - Few real exposures among many imaginary exposures, hence data not truly significant.

The medical aspect of certain special chemicals was discussed with Dr. Bryan. The following information seemed particularly significant:

(a) An Alpha radiation hazard from ingested or inhaled U234 is a definite possibility.

(b) Uranium is retained by the body in significant quantities. No data is being released, but considerable quantitative retention studies are being done at:

- (1) Berkely, California, by tracer techniques
- (2) Rochester, New York, by chemical, mechanical and biological methods.

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NOTE: The writer believes it would be desirable for Dr. Costello to keep in close touch with Major Brundage for available data pertinent to (a) and (b) above.

"PG Fog" (UO_2F_2 & HF): Visible limit probably about 4 to 5 mg./m³. An MAC of 0.15 mg/m³ is not too low. It might be advisable to lower this to 0.1 mg/m³. Available data does not justify taking any chances with UF_6 . Protective masks should be worn for even short exposures. Greatest hazard from UF_6 is uranium itself, not HF.

An animal study at a mean concentration of 20 mg UF_6 per cubic meter, 6 hours exposure for 6 days a week reports the following: (Rochester report M1795, in K-25 files.) (Tests were run for 30 days.)

Mice: 100% mortality after 3 days.
Rabbits: 95% mortality after 3 days.
Rats: 75% mortality from 4th-16th days.
Guinea Pigs: 45% mortality 4th-8th days.
Dogs: 40% mortality (on 32nd day)

Uranium was found in significant quantities in kidneys, lungs, less frequently in spinal column, pelvis, epiphysis, liver, and teeth.

U_x - Beta Radiation: Reddening of skin indicates excessive exposure: (There is a question as to whether permanent damage to cornea would have occurred.) If 1303 storage cylinder decontamination is to be done regularly, use monitoring system. Film badges and possibly finger prints.

(c) Physiological studies on C-716, C-816, C-2144 and MFL are very incomplete and inconclusive. Until more information is available consider C-716 as toxic as CCl_4 . C-816 is probably less toxic than C-716, but no prolonged exposure (or short exposure to high concentrations) is advisable for either C-816 or C-716.

C-716 Only work is single short exposure animal studies. Foreshot and crude are more toxic than refined material. No patch tests.

C-816 Crude - animal mortality at 100 ppm for 14 hour exposure. Crude is more toxic than 2nd cut.
2nd cut - Short single exposure animal study only data. No patch tests. Set MAC for 2nd cut material at not over 500 ppm for short exposure. Wear mask for any long exposure.

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C-2144 No animal mortality at 5000 ppm for 4 hour exposure. No chronic exposure data.

M.F.L. No data

(d) Essentially nothing is known about the physiological properties of the pyrolysis products of fluorocarbons. We must continue to assume that they are extremely toxic.

NOTE: Possibly a further investigation of the physiological properties of C-716, C-816, C-2144 and MFL and their pyrolysis products should be requested through Major Brundage.

(e) HF At present MAC of 3 ppm seems satisfactory. Keep track of work in progress at Rochester which might indicate this figure should be lower. Exposure of 1 hr to 30 ppm might well result in irritation followed by secondary symptoms, i e. aggravation of cold, bronchial disturbances. Repeated exposure of this order will result in bone deposits.
Sensory Observations are completely unreliable.
If the concentration is over 3 ppm insist that masks be worn even for short exposure.

(f) F2 MAC probably should be about the same as for HF, although F₂ is somewhat more toxic than HF. Watch for additional data from Rochester.
Sensory observations are completely unreliable.
Three Rochester men exposed themselves to 10 ppm. Reactions were from no effect (couldn't smell it) to marked irritation. Du Pont experience indicates man can be "conditioned" to tolerate as high as 100 ppm.

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Part III: Visit to Taylor Instrument Companies to Observe the Method of Protecting Personnel from Mercury Vapor.

The writer visited the tube shops, accompanied by Dr. R. D. Thompson, Manager of Glass Products Engineering. We interviewed the plant Safety Engineer and the nurse in charge of the First Aid Station. (The doctor was not present)

The tube shops, where thermometers are fabricated and large quantities of mercury handled, were being moved into new locations. The following observations appeared significant:

1. Considerable mercury spills were observed. (Much more than in the K-25 Instrument shops.)

2. The ventilation system provides for uni-directional air flow on a single cycle basis. No effort is made to clean and recirculate the air. Air enters at the ceiling and is removed from the floor level. Special hoods are provided where operations involve handling hot mercury.

3. New York State inspects the atmosphere periodically. In most cases the mercury contamination has been below 0.1 mg. Hg / cu meter. In one location where the room was warm and ventilation restricted, higher concentrations were found and the State recommended additional ventilation.

4. The Taylor Laboratory has a G. E. Vapor Detector, but this has not been in use, hence no daily monitoring data was available. They have found the G.E. Selenium Sulfide Indicator of practical value but not reliable for exact measurements.

5. Routine physical check-up examinations are made. This does not include analysis of urine for mercury.

6. Some personnel have gingivitis, but the nurse did not seem to think there was any significant correlation between the gingivitis cases and the jobs where mercury exposure was most likely.

7. Improvements in ventilation in recent years have eliminated the symptom of "shakes", previously very common among the old timers who had worked with mercury for long periods of time.

ROCHESTER REPORTS OF GAS MASK AND RESPIRATOR TESTS

<u>Report No.</u>	<u>Contaminants Used</u>	<u>Gas B-2 Hitlerite Canister Tested?</u>
M 1512	TO ₂ , IF ₄ , TO ₄ ·3H ₂ O, T ₃ O ₈ , F ₂	No
M 1547	Vanadium Ore Dust	No
M 1588 (E-25)	F ₂	No
M 1648	C-616 Hydrolysis Products (TO ₂ F ₂ & HF)	Yes
M 1649	F ₂	No
M 1650	C-616 Hydrolysis Products (TO ₂ F ₂ & HF)	No
M 1654 (E-25)	T ₃ O ₈	No
M 1676 (E-25)	TO ₂ F ₂ , (NH ₄) ₂ T ₂ O ₇ ·4H ₂ O, TO ₄ ·3H ₂ O, TF ₄ , T ₃ O ₈ , TO ₂ , TCl ₄ , HiGrade Ore.	No
M 1697 (E-25)	C-716, C-816	No
M 1797 (E-25)	TF ₄	No

United States Department of the Interior
Bureau of Mines, Washington, D. C.

Publications Pertinent to Testing of Gas Masks and Respirators

- I.C. 7086 Testing and Design of Respiratory Protective Devices,
by H. H. Schrenk, September 1939.
- I.C. 7130 Testing Respiratory Protective Equipment for approval,
by H. H. Schrenk, August 1940.
- I.C. 7237 List of Respiratory Protective Devices Approved by the
Bureau of Mines, by H. H. Schrenk, March 1943.
- Schedule 14E Procedure for Testing Gas Masks for Permissibility,
December 1941.
- Schedule 21 Procedure for Testing Filter Type Dust, Fume, and
Mist Respirators for Permissibility, August 1934.

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Comprehensive Summary

Carl Voegtlin, Editor-in-Chief

of the

PHARMACOLOGY AND TOXICOLOGY OF URANIUM COMPOUNDS
with Sections on the Pharmacology and Toxicology
of Certain Fluorides

Reported by

The Division of Pharmacology
Manhattan Department

The University of Rochester
School of Medicine and Dentistry
Rochester, New York

July 1, 1946

Submitted by

Andrew H. Dowdy, M. D.

Director

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FLUORIDE

Herbert E. Stokinger

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Harold C. Hodge

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 5. Discussion of the Toxicology of the Fluorine Gases
- Acute Toxicity of NaF Administered Intraperitoneally to Albino Rats.
- Bibliography

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Rochester Reports to be Requested for K-25 Files

M 1512	Stokinger.	Report on T dusts. (Respirator tests)
M 1513	Roberts.	Preliminary report on Project #50: Urinary "Alkaline" Phosphatase Activity as a Sensitive and Early Index of T-poisoning.
M 1517	Bloor.	The Determination of Minute Amounts of T in Tissues and Fluids.
M 1523	Dale.	Memo. Proposed Determinations of T in Extracted Teeth and Alveolar Bone of T-employees as a Possible Index of Bodily Storage.
M 1525A	Dessauer and Lennox.	Photographic Neutron Dosimetry to Date.
M 1541	Gilda.	X-ray Diffraction Studies on T Metal Fume.
M 1542	Dale.	The Effects of TO_2F_2 on the Oral Tissues.
M 1543	Miller.	Acute Toxicity of TO_2F_2 .
M 1547	Stokinger.	Analysis of Vanadium Ore Dust. (Respirator Tests)
M 1553	Stokinger.	Comparison of Relative Efficiencies of Filter Papers in Sampling T-dusts.
M 1554	Stokinger.	Final Report on Project #36. The Effect of Low Calcium Diet on the Deposition of T in the Skeleton and Soft Tissue of Rats Exposed to T-dusts.
M 1556	Voegtlin.	Acute Toxicity of Lead Salts in Experimental Animals.
M 1567	Dounce.	The Use of Phenolphthalein Phosphate for Determination of Alkaline Phosphatase Activity.
M 1580	Dygert, Oberg, Stokinger.	Relative Efficiencies of the Filter Paper Mask Sampler and the Glass Electrostatic Precipitator in Determining the Acceptability of Respiratory Protective Devices in T-dust Atmospheres.
M 1599	Valentine.	Leukemia.
M 1648	Dygert, Cohenour, Tarbell.	Amount of T and C-216 Retained in U.S. Army Assault Mask Canisters Containing "Whitlerite" Used for Short Period in High Concentration of C-616.
M 1649	Sanford.	Tests of Efficiency of Two Respiratory Protective Devices in Atmospheres of C-216.
M 1650	Sanford.	Tests of Efficiency of Four Respiratory Protective Devices in Atmospheres of TO_2F_2 And HF Produced by the Hydrolysis of TF_6 .
M-1656	Dessauer and Rouvina.	Photographic Neutron Dosimetry II.
M 1696	J.C. & J.F. O'Leary.	A Study of the Color in Filtrates of T Poisoned Rats Urines after Precipitation with Silver Lactate-Lactic Acid Reagent.
M 1698	Orcutt.	Studies of Attempts to Protect Against the Percutaneous Absorption of $\text{TO}_2(\text{NO}_3)_2$.

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M 1710	Orcutt Smith	Survey of the Local and Systemic Damage Caused By Application of T-Compounds to the Skin and To the Eye.
M 1713	Maynard	One Month Experiment on the Oral Toxicity of TO ₂ in Rats.
M 1714	Maynard	One Month Experiment on the Oral Toxicity of TO ₂ Acetate in Rats.
M 1724	Tishkoff	Special Report to Dr. Watters on Polarographic Analysis of C-216.
M 1767	Maynard	One Month Experiment on the Oral Toxicity of CoF ₃ in Rats.
M 1772	Dessauer Davis White	A Radiation Dose Integrator of High Sensitivity.
M 1773	Dessauer White Rouvina	A Pressure Ionization Chamber for the Measure- ment of Neutron Fluxes at Tolerance Level in Portable Instruments.
M 1796	Esler Bonner Morken	Foil Alpha Counter.
M 1798	Horton Neil Wilson	A Semi quantitative Method of Estimating Certain Boron Halides in Air.
M 1846	Roberts Bishop Brodie Wichser	Uranium Nitrate. A one Month Study at a Mean Concentration of 20 Mg/M ³ Of the Effects of In- halation By Laboratory Animals.
M 1913	Rothstein	A 30-Day Study of The Toxicological Effects Re- sulting from Inhalation of 20 Mg/M ³ of Na ₂ U ₂ O ₇ By Laboratory Animals.
M 1926	Rothermel	A Study of the Toxicological Effects of the In- halation of Uranium Tetrachloride Dust At a Concentration of 1.8 Mg/M ³ .
M 1933	Neuman Mulryan	The Effect of Water Intake on the Acute Toxicity of Uranium.
M 1932	Neuman Mulryan	The Effect of Environmental Temperature On Acute Uranium Toxicity, And The Changes In Body Temperature In Response to Uranium Injections.

DISTRIBUTION

1. K-25 Site Records (RC)
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